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Approved For Release 2003/05/14 : CIA-RDP78B05171A000600020029-1

NPIC/TBDS/MBD-1/26-6
13 November 1968

MEMORANDUM FOR: Chief, Technical Services and Support Group, NPIC

THROUGH : Chief, Research & Engineering Division, TBDS

SUBJECT : NPIC Image Enhancement Potential

25X1 REFERENCE : AFMD Memorandum [redacted] Dated 16 September 1968
Re Subject

1. In general the MBD components and personnel who are knowledgeable of this subject agree with the basic thrust of the reference which is that (a) NPIC has no significant production-oriented image enhancement capability and (b) AFMD is a logical component to assume such a function.

2. There is less agreement with some of the details in the attachment to the reference.

a. Ref. Attachment, Para II.2. The function described here appears to duplicate the MBD function in that it states AFMD "has the responsibility . . . to investigate, develop and implement advanced techniques for analyzing and interpreting degraded imagery." In order to be consistent with the rest of the AFMD paper and the established understanding of the mission and functions of the TBDS divisions this statement should be modified. The responsibility for investigating and developing such advanced techniques clearly belongs to the Research and Engineering Division. Upon discussing this matter with [redacted] of AFMD, it was determined that the statement in the reference concerning AFMD responsibility . . . was the paraphrase compiled by him. After reviewing the mission and function statements compiled by PPS dated August 1968, it was determined that no such conflict existed with the functions stated for AFMD in that document.

b. Image Enhancement. Before continuing with a detailed analysis of the AFMD paper a brief discussion of the subject of Image Enhancement is necessary.

It may not be apparent under present circumstances, but it is typical and appropriate for the scientists and engineers involved in a new development to be cautious about its utilization until it has been adequately evaluated. So it is with MBD and various "image enhancement" developments.

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SUBJECT: EPIC Image Enhancement Potential

Before we can consistently enhance images, we need to know the various properties of the image that contribute to its perceptibility, the degree of significance of each and the interrelationships between these properties. In most of the so-called "image enhancement" techniques known today some properties are improved at the expense of others--almost always resulting in a net loss of information. Accordingly, we are concerned about the utility of many of the so-called "image enhancement" techniques.

The entire imagery exploitation community including EPIC is still looking for a system to define and evaluate the properties of images that make them more perceptible and/or interpretable. In short, to our knowledge, there are no established criteria for "enhancing" imagery that will improve its interpretability--apart from the utilization of the best techniques available for high-fidelity duplication of the information captured in the original negative. In fact, most of the so-called "enhancement" techniques have been shown to result in a net loss of information.

To be sure, there is hope of improving the interpretability of an image which has been degraded by any one or a combination of several factors. This, of course, is the objective of the R&D Image Manipulation Program, but these techniques are certainly not available for routine operational utilization at this time. Appropriate AR&D personnel would be glad to brief AR&D on the extent, objectives, and status of this program in order to insure full coordination and maximum capability for the AR&D production-oriented effort.

c. Ref. Attachment, Para II.8 and 9. The status of the techniques and facilities cited in both these paragraphs is such that only special high-priority experimental jobs can be attempted. They are not suited to routine production of "enhanced" imagery.

3. Discussion. The following remarks will be addressed to matters cited in Section III, Discussion, in the reference attachment:

a. (III 3) The need for a (routine) production capability in image enhancement support is valid. AR&D is certainly an appropriate component to furnish the leadership for providing this service. However, we would caution against accepting responsibility to augment the Westover reproduction function in a way that would relieve them of the responsibility for maintaining high-fidelity reproduction standards and rigorous quality control--in other words we recommend that these image enhancement services be limited to cases which are not feasible for the Westover reproduction capability. It also appears that the PSC/RD/R&D should be brought

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to a level of capability whereby it would be able to perform the more routine services of this type, such as contrast modifications, density cuts, and logographic prints.

b. (III.5.). We are not aware of any image enhancement techniques that are available for production services which will provide as much information from a 2nd or 3rd generation dup negative as will be obtained from the careful high-quality ping from the OM without any enhancement.

c. (III.6.). This paragraph should be viewed in the light of our present limited knowledge of what actually achieves a net improvement in the interpretability of imagery and a more careful assessment of when such enhancement is economically feasible and operatic ally significant.

d. (III.10.). The plan for APED to produce a handbook is excellent, but such a handbook should be carefully edited so as not to unintentionally imply "improvements" to the imagery that may actually reduce the information contained in it. Many enhancement techniques are displayed on low resolution imagery in such a way that this information loss is not apparent.

4. Recommendations. The following remarks will be addressed to Section IV, Recommendations, in the reference attachment

a. (IV a.). Generally concur. Suggest changing to, Management designate APED to be responsible for providing leadership and coordination for production-oriented imagery enhancement required to support EPIC exploitation operations.

b. (IV b.). Defer until local coordination is achieved.

c. (IV c.) This should be done as a joint activity in coordination with the NED CCB observer with appropriate correlation to our R&D program in this area.

d. (IV d.). Much work remains to be done in this area. Definition of the image perceptibility characteristics is the most significant missing foundation data. The justification of the cost of such an extensive R&D program may be difficult.

e. (IV e & f). NED/ATB/EL will be glad to provide laboratory assistance and to work together with APED personnel in this effort when feasible, but this is obviously not a practical arrangement for general production oriented activity.

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5. RED would again like to express its support for the general proposal made by APED in the reference--with the cautions noted above. Within the general limits we have cited, we stand ready to cooperate with APED in establishing a first-rate production-oriented imagery enhancement capability at NPIC.

6. Preparation of this memorandum has been coordinated with Messrs. [REDACTED] RED and Messrs. [REDACTED]

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[REDACTED]
Special Assistant for Plans & Applications, [REDACTED]

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